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one of the most deadly and most painful of diseases may be conquered. The Society for the Prevention of Cruelty to Animals ought to bend all of its energies to stopping the men of science from making any use of these mice. If they do not successfully interfere, it is likely that cancer may be conquered as thoroughly as diphtheria, which has been reduced from one of the most destructive scourges of children to a point where, if the antitoxin is taken in the first twenty-four hours, the death-rate is only about one and a half per cent.

A fight is going on against the gipsy moth, the hookworm, and other well-meaning inhabitants of the globe. We suggest that bills be introduced by humanitarians into all the legislatures to protect these guiltless creatures. Rats are unpopular just now because of the fact that they carry the bubonic plague and other diseases. There ought to be organized at once a society for the protection of rodents.

The more reasonable these bills may be made to sound, the more chance there is that they may accomplish some unspeakably fatal blow against the human race. There are laws now in plenty forbidding cruelty. The great institutions which are specially aimed at by the cranks, like the Rockefeller Institute, are in the hands of men who are spending their lives in the cause of solid and real kindness. Shall we take away from splendidly equipped experts of devoted character the right to judge what experiments are necessary, and put the question into the hands of some fool committee made up of persons in whom hysterical excitement takes the place of knowledge?—*Collier's*.

SCIENTIFIC BOOKS

ELEMENTARY BIOLOGIES

BIOLOGY is unique among her sister sciences in the wealth of variation in the methods of presenting the subject to beginners. It has been truly said that there are as many methods in this work as there are men conducting it. In the minds of many, this is as it should be, for there are requirements for one which

are not for another. The technical school emphasizes certain things which will not form a part of the course given in the classical college. The material or *content* varies.

It is a question in the writer's mind as to how much the *method* of presentation should vary in the several conditions. The following well-marked methods of teaching beginning biology are recognizable: (1) Biology as an integer, not resolved into its components, zoology and botany. As subdivisions of this category, one finds: (a) The type method, introduced into this country when Martin, in 1868, adapted Huxley's "Biology" to the students entering American colleges at that time. The evolutionary chain was emphasized and morphology was predominant. (b) The two-type method, which Sedgwick and Wilson used in their text, one animal and one plant being selected and studied exhaustively, others being presented as comparisons. The functions of living matter were considered equally with the morphological features. (c) A method, not especially new but well marked in the "General Biology" of Needham,¹ where the *principles* are emphasized, illustrations being selected towards that end and morphology reduced to a minimum; types as such are scarcely recognizable. With the second great division (2), the science is resolved into its components, zoology and botany, but we may distinguish here, as before, well-marked subdivisions, (a) where the biological aspect is maintained and (b) where the work is presented as purely botany and purely zoology, with no reference to the common ground between them.

There have been published recently, in this country and abroad, several books whose purpose is to fill one of the fields given above. Kirkaldy and Drummond² have followed 1a in giving a discussion of isolated types, with little intercommunicating cement. If biology is a science, as chemistry is a science and physics is a science, having definite content and definite principles, one would never de-

¹ Comstock Publishing Co., Ithaca, 1910.

² "An Introduction to the Study of Biology," Oxford, 1909.

termine the fact from this English text. There is left in the mind of the student a series of chapters from the story-book of living things, each complete in itself and bearing only remotely upon what precedes or follows. The clever student will find the thread, but only he.

At the present time, no text has been written from the point of view of the Sedgwick-Wilson method, although there is in progress a book which will embody this idea, the types being somewhat different. Therefore it can not be assumed that this method is being abandoned, as judged by the production of texts representative of it.

The text of Professor Needham, referred to above, must be classed separately. As we have already said, principles are considered in the light of selected examples, which are described in so far as the matter in hand demands. If this point be borne in mind by the reader of the book, he will scarcely urge the criticism that the treatment is superficial. The illustrations, many of which are original, are supplemented by photographs, and the quality of book-making is such that the figures, although inelaborate, are ample. The absence of time-honored pictures is refreshing. The attempt to bring into the book the results obtained in the laboratory of the investigator of the present is happily accomplished. The work of the American school of cytologists and the experimental or analytical school in general is covered, briefly, it is admitted, but, in the mind of the reviewer, logically and sufficiently clearly to be appreciated by the student. Much of the data of the volume concerns the insect world and this is readily understood when the principal interest of the author is considered. It may be said that there is little material discussed in the book which is not readily placed in the hands of the students of any institution.

The beautifully illustrated little book of Dr. Kraepelin³ is moulded in a manner similar to the text of Needham. Professor Needham's book may be used as a laboratory guide

and field companion, and in this respect it differs from all other texts mentioned here, with the possible exception of the one of Hegner. It is a matter much to be regretted that the students of American institutions of learning, even after they have passed two or three years in the work, are unable to use books written in foreign languages. There is no English volume which can approach this German book in wealth of text-figures, some of which are colored. The text itself is well in keeping with the book-making, and in the experience of the writer the book as a whole is inspiring to the student who can master the written word, little as it may be. The futility of presenting a book of the quality of Kraepelin's to English students is readily seen when one attempts to translate the book into English and put it upon the market at a German standard, still maintaining the selling price of the original (four Marks). Some cooperation may sometime be possible between the departments of Romance and Germanic languages and the scientific departments of our universities and colleges which may be beneficial to both.

McFarland's⁴ book can scarcely be called a text, but rather a reader. As such it will be useful, although the illustrations are poor throughout, many of no value whatsoever and the language is at least the limit of possibilities for the average student of beginning biology. He will be found clamoring for Anglo-Saxon words when he opens the first chapter to read:

To study the problems of life apart from their cosmic relations is to lose much of their significance. It is only by an appreciation of the endless changes—integrations and disintegrations—that pervade the universe that one comes to realize that those qualities by which we recognize living substance more or less closely correspond to the qualities of all substance and those forces by which it is animated to those forces by which the universe itself is controlled.

The medical side of the book is evident in the later chapters of the volume, such as

³"Einführung in die Biologie," Teubner, Leipzig, 1909. (Stechert.)

⁴"Biology, General and Medical," Saunders, Philadelphia, 1910.

Blood Relations, Parasitism, Grafting, Senescence and Mutilation and Regeneration. When it is considered that more than nine tenths of the students taking the course in beginning biology go no farther in that department, we come to realize that our course should be so shaped that this great majority receive the consideration, and not the few who later become students in higher courses. It is for this reason, if for no other, that the economic side of the subject is warranted. Not that this be overdone. There is a danger that our references become so anthropocentric that we shall need another Galileo; man must be kept in his proper relation with the universe at large, and bacteria, moulds, pathogenic protozoa and antibodies must be seen to be part and parcel of this universe and not designed as helpers or scourges of mankind.

There is in this book a laxity in attention to details that will be discovered by the careful reader. Regeneration and continuous growth are two different things, although the author treats them as one. Mitosis precedes the appearance of the bud in the growing yeast and not *vice versa*. The granular theory of protoplasmic structure is *not* generally conceded. The figure of a typical cell, copied from Huber, is wretched and misleading. But it is easy to tear down and hard to construct. The book is inspiring to the student who looks broadly at the subject and one wishes it were more adapted to the needs of the modern American boy.

Hegner⁵ has designed his text to occupy the first half year of a course where the second half year is devoted to vertebrate zoology. But it is not, *sensu strictu*, an invertebrate zoology. It falls in our category, 2a, being a biology with especial reference to invertebrates. The attempt is made to present the newer zoology to the beginner. Here we find the figures of Jennings, Yerkes, Morgan—in fact it may be called an American product from cover to cover. Consequently, the student finds himself at home at once among

American forms and American names. It is not to be understood, however, that the view is circumscribed and that the data from foreign sources are eliminated.

Leaving aside for the present time the value of introducing the student directly to the unseen world of the protozoa, it may be said that the result is excellent in the light of the labor set before its author. The book-making is good, the illustrations are carefully selected and there is a unity in the volume which appeals very strongly to the reviewer. There are, as before, places where changes in future editions may be suggested. It is discouraging to the student to be introduced to pages of Greek and Latin terms at the outset. Sufficient unto the later pages is the evil thereof; let us not blunt his zeal at the start. The description of photosynthesis is so involved with that of respiration that the average student will not untangle them, and when the statement is made that "one group of processes (respiration) uses the waste products of the other (photosynthesis)" the error is obvious, for while this may be so for a part of the time, the relation does not exist at others (in darkness). As Professor Alexander Petrunkevitch has pointed out, the figure from Dahlgren and Kepner illustrating the alveolar hypothesis of protoplasmic structure is wrong, inasmuch as this theory involves a foam structure and not that of an emulsion. Amitosis should not be given the prominence that it enjoys in the book, whatever the personal views of the author, for the statements are not warranted by recent investigations. Moreover, the selection of Wheeler's drawings of amitosis in the follicles of the insect ovary to illustrate amitosis as a process of cell-*multiplication* is not fortunate, inasmuch as there is only *nuclear* and not cytoplasmic division. Maupas's schema of the effects of isolation from conjugation in *Paramecium* is given, although the text states, rightfully, that the work of Woodruff and others, such as Gregory and Jennings, has led to a different interpretation. Schultze's figures of the development of the sponge are adopted, although there is perhaps nowhere in biology a more difficult bit of

⁵ "An Introduction to the Study of Zoology," Macmillan, 1910.

ontogeny to understand and to leave these figures without complete description is to give the student the impression that simple epiboly is involved. These are but passing thoughts and are not in any way meant to detract from the value of the book.

The question, however, remains, how many institutions could equip their students with the apparatus which is practically necessary for the carrying on of work along the lines laid down by Hegner? It will be remembered that the exact studies on the behavior of protozoa were made possible through the application of the Greenough binocular microscope in the hands of Jennings and others. The time necessary for the development of technique for such experimental work had better be spent, in the mind of the present writer, in covering the subject of biology somewhat more broadly. Again, there are not many students in the first year in the subject who could make much of a series of demonstrations of the development of *Cambarus*. It may be that the present writer does not understand fully the *raison d'être* of the book and that the illustrations are not covered in the laboratory. If this is true, why bring into the student's mind at all the intricacies of crustacean development? It does not involve any more completeness, for there are still many things left out of consideration, such as phylogeny. Does embryology rightly form a part of the beginner's training? Above all, dogmatism is the *bête noire* of all teaching. Is it not necessary to be dogmatic in teaching embryology in this course? Can the data be verified by the student?

It is the firm belief of the present writer that the division of the subject into its two grand divisions is a decided loss to the general student. Living things, after all, partake of the same general characters. The more plants are studied in terms of animals, the better they have been understood. The best zoologist is he who has had at the same time the best botanical training. If it be urged that there are few men who are capable of covering the two fields well, the answer may be made that it is so much the more deplorable. Specializa-

tion is carried too far even for the good of investigation if the zoologist can not think in terms of plants. The great principles of the science have been formulated by studies upon both plants and animals. A well-marked instance of this is the present-day work in genetics, in sex, in growth and the like. If this is true, why not give the student the advantage of it?

It is the belief of the writer, too, that more than one year can very seldom be given by the general student to any one science. Unless he be a prospective student of medicine, sanitation or biology itself, his major work must of necessity take him into other fields. The deplorable ignorance of the average art student in things biological would be more quickly effaced if he were able to gain in one year a comprehensive course in this subject comparable to that he may receive in physics and in chemistry. To present the subject as zoology and botany defeats the end.

The physicists and chemists have found time from their research to discuss teaching methods in their respective subjects, but the biologist—well, the biologist is made of finer stuff. A symposium upon elementary biology at the American Association, resembling the discussions of the chemists and physicists which have been held in the past, would be most valuable to all who are concerned, directly or indirectly, in presenting the subject to the students of our universities and colleges.

MAX W. MORSE

TRINITY COLLEGE

Metabolism in Diabetes Mellitus. By FRANCIS G. BENEDICT and ELLIOT P. JOSLIN. Carnegie Institute of Washington, 1910.

The book contains 193 tables. It has the detailed record of work on thirteen cases of diabetes, ten classed as severe and three as light. Calorimetric measurements have been made, the carbon dioxide excretion and oxygen absorption recorded, urinary analyses accomplished, and the influence of food observed. It represents the most ambitious attempt yet made in the study of human diabetes and is a

sincere endeavor to elucidate the problems connected with this disease.

One of the most interesting features of this very extensive and laborious piece of work is the discovery of a constantly low respiratory quotient in patients suffering from severe diabetes, which accords with theoretical expectations.

On page 211, the authors state that after giving beefsteak to a diabetic, "the excretion of sugar in the urine . . . was not sufficient to indicate the excretion of a large part of the non-nitrogenous portions of the steak in the urine." But the sugar rose from 3.1 grams per hour to 8.6, an increase of 5.5 at the same time that the nitrogen elimination rose from 0.57 to 1.25, an increase of 0.68 grams per hour, which corresponds to increased protein destruction of 4.3 grams! According to this computation, 5.5 grams of dextrose might have arisen from 4.3 grams of protein which certainly does not support the negation quoted above.

The reviewer is forced to disagree with the main contention of the book, that the heat production in severe diabetes is 15 per cent. higher than the normal. The error of Benedict and Joslin is twofold. In the first place, their group of normal individuals, nine in number, include three weighing respectively 74, 80 and 83 kilograms. These are not fairly comparable with diabetics weighing between 45 and 65 kilograms. In the second place, the high metabolism obtained from a diabetic individual weighing 45 kilograms who was "extremely highstrung, nervous and apprehensive," and "not an ideal subject," plays quite a part in the average results upon the diabetic patients. If the heavier, normal individuals be excluded, then six weighing between 48 and 67 kilograms produce 1.27 calories per kilogram per hour, and if the excitable diabetic be excluded, it is found that five individuals with severe diabetes and weighing between 49 and 65 kilograms, show an average heat production of 1.34 calories per kilogram, which is an increase of 5 per cent. above the normal, or about that obtained by other observers.

GRAHAM LUSK

SCIENTIFIC JOURNALS AND ARTICLES

THE contents of *Terrestrial Magnetism and Atmospheric Electricity* for March, 1911, are as follows:

"Two New Types of Magnetometers made by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington," J. A. Fleming.

"The Peculiar Magnetic Disturbances of December 28-31, 1908," R. L. Faris.

"On a Variation in the Intensity of the Penetrating Radiation at the Earth's Surface Observed May 19 and 21, 1910," A. Thompson.

"Le Projet du Levé Magnétique de l'Empire Russe et les Travaux Magnétiques," M. Rykatchew.

"The Physical Theory of the Earth's Magnetic and Electric Phenomena. No. III. The External Electric Currents and the Earth's Magnetization," L. A. Bauer.

"Magnetic Storms Recorded at the Cheltenham Magnetic Observatory, October 1 to December 31, 1910."

"Atmospheric Electricity Observations on the Belgica in 1907," H. F. Johnston.

SPECIAL ARTICLES

NOTE ON A CONGLOMERATE DIKE IN ARIZONA

WHILE mapping the surface geology of Silverbell, Pima County, Ariz., in connection with a study of the ore deposits of that district, the writer found a conglomerate dike which seems to differ enough from the majority of clastic dikes previously described to justify a short note on its occurrence and probable origin.

On a claim known as C. M. C. No. 4, about a mile north of the town, one of the many intermittent streams of the region has cut a gulch in a dark-colored quartz-porphry. In the bottom of this gulch and running parallel to it is a vertical fissure from six to eight inches in width filled with a hard compact mass of fragmental material. The fragments are generally angular and vary in size from grains of exceeding fineness to pieces of rock two inches or more in diameter. The greater part of the material is the quartz-porphry that forms the walls, but a variety of other igneous rocks known to occur in the hills beyond the head of the gulch is also notice-